# Shared Decision Making for Adults with Hearing Impairment: Application of Readability and Quality Measures

Zoë Haws

A thesis submitted in partial fulfilment of the requirements for the
Degree of Master of Audiology
Department of Communication Disorders
University of Canterbury
2018

**Abstract**

Health consumers need readable, high quality information to support their health literacy and engagement in shared decision making. The purpose of this study was to assess whether the use of plain language improved the readability and quality of audiology consumer information on the American Speech-Language-Hearing Association (ASHA) website. Thirty two articles written in English were assessed. Reading grade levels for each article were calculated via the Flesch-Kincaid Grade Level (F-K), Gunning Fog Index (FOG), Fry (FRY) and the Simple Measure of Gobbledygook (SMOG) formulas. Results were compared to reading grade levels recommended by health literacy experts and historical assessments of ASHA audiology consumer information articles. Article quality was measured using the DISCERN tool. The relationship between article readability and quality was assessed. The article with the highest reading grade level and lowest quality score was revised to demonstrate the feasibility of improving both of these measures. The mean readability scores were significantly higher than the recommended grade level of six for all measures used. Comparison over time showed the use of plain language improved readability. No improvement was found between the results of that initial revision and the articles analysed in this present study. The mean quality score of the articles was 2.93 out of 5, with large variation in scores. This finding indicates potentially serious shortcomings for some of the material. No significant relationship between readability and quality was found. The application of plain language principles is insufficient to ensure consumer hearing health information is accessible or supports shared decision making.

*Keywords*: health literacy, hearing, consumer, readability, quality, DISCERN, shared decision making

**Acknowledgements**

I would like to thank the staff of the Department of Communication Disorders, especially my supervisor Dr. Rebecca Kelly-Campbell, for their dedication to the Master of Audiology programme and support I have received to complete it. Thank you also to the many organisations that generously supported our studies through the provision of clinical placements, textbooks and other learning opportunities.

A demanding programme such as the MAuD is partly a team effort – much gratitude and respect goes to my new friends and future colleagues from the Class of 2017. My husband Ian Hector deserves special acknowledgement for his patience, support and encouragement behind the scenes.

This thesis is dedicated to the hardest worker and kindest person I have ever met - my Dad, Gordon Haws. The values I learned from you will hold me in good stead as a clinician. I'm so glad you got to see me find my niche in audiology.

# Table of Contents

## List of Tables

## List of Figures

## List of Abbreviations

AIS Audiology Information Series

ASHA American Speech-Language-Hearing Association

F-K Flesch-Kincaid Grade Level

FOG Gunning Fog Index

FRY Fry readability formula

ICC Intra-class coefficient

ICF International Classification of Functioning, Disability, and Health

ICTs Information and communication technologies

OECD Organisation for Economic Co-Operation and Development

PCC Person-centred care

RGL Reading Grade Level

SAM Suitability assessment of material

SDM Shared Decision Making

SMOG Simple Measure of Gobbledygook

WHO World Health Organisation

# Chapter 1

## Overview

Millions of adults in the United States experience hearing impairment. Hearing impairment can negatively impact quality of life for an individual and their significant others. Low health literacy can impede rehabilitation interventions and compound the negative effects of hearing impairment. Audiologists have ethical and clinical imperatives to practice person-centred care (PCC), which encompasses the needs, desires and values of the patient and their significant others (Pryce & Hall, 2014). In order to achieve person-centred care, audiologists need to support patients to engage in shared decision making (SDM) and become active partners in their treatment. To engage in SDM, patients need effective resources to help them understand the consequences of their decisions (Barry & Edgman-Levitan, 2012). The internet is an important source of health information, including hearing health. Hearing health information on the internet is of varied quality, and there are important inequalities in access to it. Readability is a fundamental aspect of accessibility.

## Prevalence of hearing impairment

According to the World Health Organization (WHO), an estimated 466 million people worldwide have a disabling hearing loss – 432 million of whom are adults (WHO, 2018). In these figures, disabling hearing loss is defined as being greater than 40 dB in the better hearing ear in adults and greater than 30 dB in the better hearing ear in children. It is estimated that by 2050, over 900 million people will have disabling hearing loss. Most people with disabling hearing loss live in low and middle-income countries. Approximately one third of people aged 65 years and over have a disabling hearing loss (WHO, 2018).

In the United States, Lin, Niparko, and Ferrucci (2011) estimate that 30 million Americans, comprising 12.7% of the population aged ≥ 12 years, had a significant bilateral hearing loss (as defined by hearing thresholds ≥ 25 dB at .5, 1, 2 and 4 kHz). When including unilateral losses with the same audiometric criteria, this estimate increases to 48.1 million or 20.3% of the population aged ≥ 12 years. Approximately 15% of adults in America (37.5 million) aged ≥ 18 years self-report trouble hearing (Blackwell, Lucas, & Clarke, 2014). While the annual prevalence rate of hearing loss in adults in the United States appears to be declining over time (Hoffman, Dobie, Ko, Themann, & Murphy, 2010; Zhan et al., 2010), the overall prevalence of hearing loss is expected to rise because of the aging population (Lin et al., 2011).

**International Classification of Functioning, Disability and Health**

In 2001, the WHO published the final International Classification of Functioning, Disability and Health (ICF) (WHO, 2001). The ICF frames the impact of health conditions in terms of an individual's assets in regards to function, activity and participation in society. This represents a major shift away from previous classification systems that described impairments in relation to disability (the inability to perform tasks because of the impairment) and handicap (the negative impact that a disability has on a person's quality of life). The conceptual framework of the ICF is widely regarded as a positive development (Boothroyd, 2007; Stephens, 2001).

The ICF integrates biological, psychological and social aspects of functioning (Danermark et al., 2013). The aims of the ICF are to provide a scientific basis for studying health, establish a common language for describing health, enable comparison of data, and provide a systematic coding scheme for health conditions (WHO, 2001). The ICF framework contains two parts, each with two components: Part 1, Functioning and Disability consists of a)

Body Functions and Structures and b) Activities and Participation. Part 2, Contextual Factors consists of c) Environmental Factors and d) Personal Factors. Each component can be expressed in both positive and negative terms (WHO, 2001).

Domains of participation according to the ICF are as follows: d1) Learning and applying knowledge, d2) General tasks and demands, d3) Communication, d4) Mobility, d5) Self-care, d6) Domestic life, d7) Interpersonal interactions and relationships, d8) Major life areas, and d9) Community, social and civic life (WHO, 2001). Each component and domain consists of extensive sub-categories.

### Hearing impairment and the ICF.

The ICF has been applied to a range of health conditions, including hearing impairment. Studies of hearing impairment in relation to the ICF highlight both the complexities of the impacts and mitigating factors associated with hearing impairment, and the flexibility of the ICF as a tool to capture these (Granberg, Pronk, et al., 2014; Granberg, Swanepoel, et al., 2014). In one study of aspects of functioning, disability and contextual factors relating to hearing impairment, a total of 209 distinctive ICF categories were identified, with approximately half of these categories mentioned by at least 5% or more of the 63 hearing health professionals surveyed. These 209 categories represent more than half of the entire ICF classification categories available. The most common categories related to communication in the activities and participation component, and hearing aids and noise were the most frequent environmental factors. Mental functions including confidence and emotions were also frequently emphasised (Granberg, Swanepoel, et al., 2014) .

The ICF has also been used to describe the third party disability relating to an individual's hearing impairment (Hickson & Scarinci, 2007; Scarinci, Worrall, & Hickson, 2012). Third party disability can affect significant others, including spouses or adult children of those with hearing impairment (Preminger, Montano, & Tjørnhøj-Thomsen, 2015; Scarinci, 2009). An example of third party disability experienced by a spouse of a person with hearing impairment in the domain of Community, social and civic life, is being unable to go to the movies or theatre (subcategory d9202) because of their partner's hearing difficulties (Scarinci, 2009)

## Interventions to treat hearing impairment

A wide number of interventions are available for different types of hearing impairment, patient needs, and patient preferences. These may involve medically or surgically resolving the site of lesion (in the case of some types of conductive hearing loss), or bypassing the site of lesion itself (in the case of implantable devices). Audiologists can provide an array of interventions, in addition to or instead of medical or surgical management of hearing impairment. Boothroyd (2007) argues that audiologists tend to exclusively focus on sensory management when treating hearing impairment, typically by providing hearing aids or cochlear implants. A broader, more holistic view of aural rehabilitation is likely to optimise activity, participation, quality of life and self-assessed benefit of device use (Boothroyd, 2007).

### Aural rehabilitation.

The goals of aural rehabilitation are to reduce and mitigate the negative impacts of hearing impairment (Tye-Murray, 2009). This thesis will focus on adults with acquired hearing

impairment, hence the focus on *re*-habilitation as opposed to habilitation for those with early-onset hearing impairment (Tye-Murray, 2009). Boothroyd (2007)'s holistic model of aural rehabilitation encompasses sensory management, instruction, perceptual training and counselling. In terms of the ICF, holistic aural rehabilitation addresses deficits in function, activity restrictions and participation restrictions caused by pathologies of the cochlea (and brain), resulting in improved quality of life (Boothroyd, 2007).

***Sensory management.***

Sensory management involves targeting the deficits in hearing function caused by pathology of the ear and / or brain. Hearing impairment can cause deficits in a range of specific perceptual functions, including detection threshold, dynamic range, frequency range, spectoral and temporal resolution, acoustic pattern discrimination, direction and distance perception, attention, auditory working memory, speed of cognitive processing and tolerance of noise (Boothroyd, 2007). Amplification can be provided via traditional acoustic hearing aids or implantable devices. Cochlear implants can provide auditory sensation to individuals with profound hearing loss. Accessories such as remote microphones or amplified telephones, and assistive devices such as flashing door alarms can help alleviate participation restrictions due to hearing impairment.

***Instruction.***

Many adults with acquired hearing impairment have unrealistic expectations about the degree of auditory function they can regain with hearing devices – they expect a full 'cure'. Discrepancies between a person with hearing impairment's expectations and reality can lead to partial use of hearing devices, non-use of hearing devices, or continued avoidance of situations

where the device may be beneficial and aid participation (Boothroyd, 2007). Instruction is vital to avoid these outcomes, and forms a key part of holistic auditory rehabilitation (Boothroyd, 2007). The first priority of instruction is for the adult with hearing impairment to gain knowledge of and make effective use of their hearing device and communication situation. All users of hearing devices also need to understand their hearing loss, and the benefits and limitations of the devices they use. They need to be able to maintain their devices and mitigate the inconveniences of device use. Persons with hearing impairment also need to be aware of the barriers and facilitators of good communication (Boothroyd, 2007). It is clear that sensory management needs to be accompanied by instruction. Audiologists may need to provide repeated demonstration and coaching in addition to verbal and written materials (Boothroyd, 2004, 2007) .

***Perceptual training.***

All hearing aid or implant users (with acquired hearing impairment) need to adjust to auditory inputs that are degraded and / or different to what they experienced when they had normal hearing. This can occur naturally during everyday communication, and also formally through perceptual training. Auditory or auditory-visual (i.e. speech reading) perceptual training can enhance spoken language perception, and potentially increase participation and quality of life (Boothroyd, 2007).

***Counselling.***

Boothroyd (2007) states that counselling is the primary means of addressing participation restrictions and deficits in quality of life. In contrast to instruction, in this model counselling refers to providing the person with hearing impairment (and potentially their significant others) the opportunity to discuss their hearing impairment and how it affects them. Their feelings about

this can be addressed, and strategies to address the practical, social and emotional consequences can be developed. The goal of counselling is to encourage participation and quality of life in the presence of remaining functional and activity limitations (Boothroyd, 2007).

**Person-centred care**

According to the Institute of Medicine, person-centred care (PCC) describes treatment that respects and is responsive to patient preferences, needs and values; and ensures that the patient's values guide all clinical decisions (National Research Council, 2001). Person-centred care is also sometimes referred to as patient-centred or family-centred care (Grenness, Hickson, Laplante-Lévesque, & Davidson, 2014). Patients should be educated about the essential role they have in decision making, and be given quality information and tools to help them understand their options and the associated risks and benefits (Barry & Edgman-Levitan, 2012). Person-centred care has been proposed as one of the fundamental approaches to improve the quality of healthcare in the United States (National Research Council, 2001).

Patient-centred care can improve patient outcomes. In an observational study in a primary care setting, patient-centred care was ultimately associated with better recovery from the health concern that prompted the appointment, and fewer diagnostic tests and referrals being carried out. Patient-centred care was also associated with patients reporting better emotional health two months after the appointment (Stewart et al., 2000).

Inherent to the concept of PCC is the principle that 'good outcomes' have to be defined in relation to what is meaningful and valuable to the person receiving treatment (Guyatt, Montori, Devereaux, Schünemann, & Bhandari, 2004). There have been some concerns that patient-centred care, which focuses on individual needs, is at odds with an evidence based approach -

which tends to consist of population-level evidence. However, PCC incorporates both (Epstein & Street, 2011).

In order to achieve PCC, clinicians and patients need to engage in shared decision making regarding treatment choices. To be able to do this, patients need to be provided with high quality health information that is accessible to them, and will support their health literacy. Readability is a core component of accessibility (Figure 1).

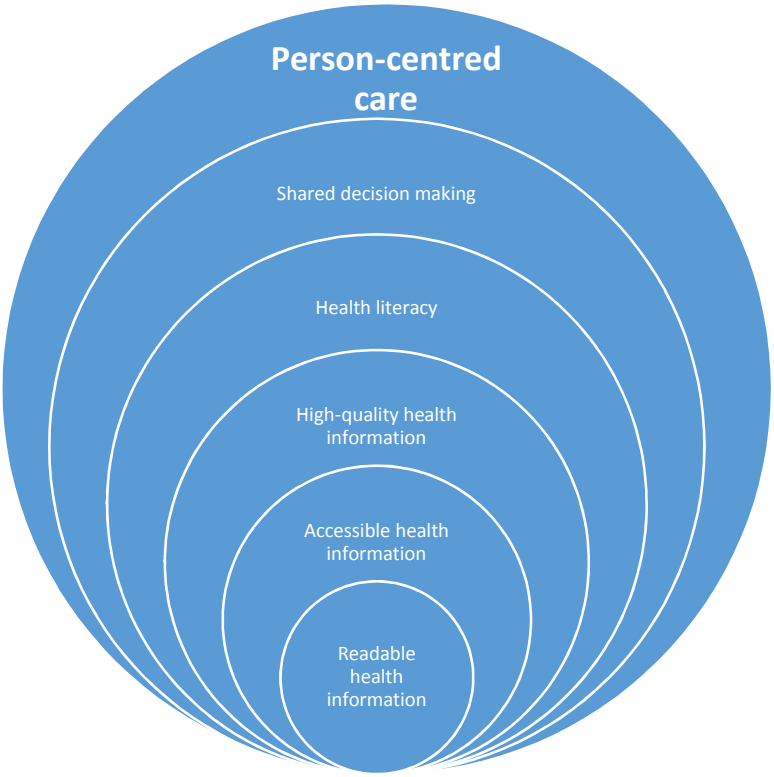



*Figure 1:* Components of and precursors to person-centred care: the inter-relationship between readable health information, accessible health information, high quality information, health literacy, and shared decision making.

**Shared decision making as a component of PCC.**

Shared decision making (SDM) is a core component of PCC. The SDM process involves both clinician and patient exchanging information, participating in decision making regarding and agreeing on treatment (Pryce & Hall, 2014). Shared decision making is useful for healthcare conditions where there are multiple evidence-based treatment options, with different risks and benefits (Pryce & Hall, 2014). Shared decision making has been advocated for in the literature for nearly 50 years, since first raised by (Veatch & Veatch, 1972). Traditionally, Western medical care has been characterised by a *paternalistic* model of decision making, whereby clinicians make treatment decisions on behalf of patients, whose participation in the treatment process may be limited to providing consent for the treatment plan (Emanuel & Emanuel, 1992). In some health care settings, this may be the preferred and most feasible model, such as in emergency medicine (Charles, Gafni, & Whelan, 1997). However, there are ethical and outcome-driven reasons why such an approach may be problematic. Hurley, Birch, and Eyles (1992) highlight that

> *"... while the health provider possesses better knowledge regarding the expected effectiveness of health care in improving health status, the individual knows best how improvements in health status affect his or her well-being"* (p. 4).

In an informed decision making model, information tends to flow in one direction, from clinician to patient. The onus is then on the patient to make a treatment choice. In contrast, in a SDM model, both clinician and patient exchange information that may be both medical and personal in nature. There is scope to involve others, such as family members, in the decision

making process. Ultimately, treatment choices are jointly made by the clinician and the patient (Charles et al., 1997; Charles, Gafni, & Whelan, 1999). Characteristics of different models of treatment decision making are compared in Table 1.

*Table 1:* Comparison of models of treatment decision making. Adapted from: Charles, Gafni & Whelan (1999).

| Analytical stages | | Models | | |
|---|---|---|---|---|
| | | *Paternalistic* | ***Shared*** | *Informed* |
| Information exchange | Flow | One way (largely) | **Two way** | One way (largely) |
| | Direction | Clinician → patient | **Clinician ↔ patient** | Clinician → patient |
| | Type | Medical | **Medical and personal** | Medical |
| | Amount | Minimum legally required | **All relevant for decision-making** | All relevant for decision-making |
| Deliberation | | Clinician alone or with other Clinicians | **Clinician and patient (plus potential others)** | Patient (plus potential others) |
| Deciding on treatment to implement | | Clinicians | **Clinician and patient** | Patient |

In a systematic review of randomised controlled trials of SDM versus non-SDM treatment, Joosten et al. (2008) found that SDM is especially suitable for chronic illnesses requiring long term decisions, and when treatment involves more than one session. Studies of the use of SDM in such conditions often showed improved satisfaction, adherence, reduced depression and improved wellbeing. These findings are especially pertinent in hearing health care, where most conditions are chronic and require long term decisions; for example whether or not to purchase hearing aids to treat sensorineural hearing loss. Furthermore, positive patient

outcomes in hearing aid use are strongly influenced by patient satisfaction and adherence (Laplante-Lévesque, Hickson, & Worrall, 2010).

Conventional audiological diagnostic testing methods, such as pure tone audiometry, are poor predictors of functional hearing and intervention outcomes (Davis, Smith, Ferguson, Stephens, & Gianopoulos, 2007). This makes it especially important that audiologists fully engage their patients in understanding the complexities of hearing loss, and share different management options and their limitations (Pryce & Hall, 2014).

Authors Pryce and Hall (2014) advocate for the use of SDM in audiological practice for the following reasons:

1. *An ethical imperative* – (Stiggelbout et al., 2012) argue that clinicians cannot carry out ethical practice, adhering to the principles of autonomy, beneficence, non-maleficence and justice, without integrating SDM into clinical care.

2. *Improvement of patient knowledge and involvement in care* – patients who actively participate in their own healthcare are more likely to have better health outcomes, and adhere to their treatment plan (Kuehn, 2009).

3. *Reduction of pressure on clinicians* – empowering patients to share decision making can reduce clinicians' feelings of frustration, inadequacy and powerlessness that may divert their management focus, especially for patients with multiple complex needs (Pryce & Hall, 2014).

4. *Reduction of preference misdiagnosis* – when patient preferences are misunderstood and patients are prescribed a treatment plan that does not align with their preferences (Pryce & Hall, 2014).

5. *Reduction of unwanted variation in healthcare use* – preference misdiagnosis may contribute to regional variation in healthcare use, such as seen in disparities in cancer treatments performed between different regions. In the absence of difference in funding or facilities, it is thought these regional differences reflect clinicians' preferences, rather than patient choice. Shared decision making may reduce this undesirable variation (Pryce & Hall, 2014).

6. *Potential reduction healthcare costs* – it has been proposed that shared decision making can lead to reduced healthcare costs in some clinical specialties, as patients are more likely to choose cheaper, conservative treatment options (Pryce & Hall, 2014).

However, it should be noted that not all patients wish to engage in the same level of SDM. There are a variety of individual, cultural, gender and generational factors that may influence a patient's desire for shared decision making. Data from the national General Social Survey in the United States showed that while nearly all respondents preferred to be offered choice and asked their opinions regarding medical treatment, half of respondents preferred to leave final decisions to their physicians. Women, more educated and healthier people were more likely to prefer an active role in decision making regarding their treatment choices. Ethnic

differences in preference for SDM were also found. Preference for an active role increased with age up until 45 years, and then declined (Levinson, Kao, Kuby, & Thisted, 2005).

## Hearing health information

### Use of the internet to access health information.

As of 2018, 89% of adults in the United States use the internet (Center, 2018). In 2011, (Fox, 2011a) reported that accessing health information online was the third most common reason people use the internet, after email and general information searching. At that time, 80% of all internet users were using the internet to find health information (Fox, 2011b). While these data are out-of-date, it is likely that this trend continues today, and that the internet remains an important source of health information, and health information an important driver for internet use in the United States. The internet is the second most influential information source for people facing a health decision, after clinician advice (Couper et al., 2010).

Adults in the United States who experience barriers to health care services that are unrelated to their insurance coverage – for example being unable to obtain a doctor's appointment – are twice as likely to use the internet to find health information compared to those who did not experience the same difficulties (Amante, Hogan, Pagoto, English, & Lapane, 2015). The authors highlight the added importance of accurate and reliable health information for those accessing facing barriers to healthcare, whom are using online information sources in lieu of personalised care (Amante et al., 2015).

People do not solely use the internet to find health information for themselves. Among those most likely to use the internet to find health information are adults who have provided unpaid care for others in the last 12 months (Fox, 2011a).

The internet may be a preferred means of communication and source of information for people with hearing impairment, as it is visually based and poses reduced auditory barriers compared with other mediums (Peddie & Kelly-Campbell, 2017), as was observed in a study of adolescents with hearing impairment by (Barak & Sadovsky, 2008).

## Accessibility of hearing health information on the internet.

### *The digital divide.*

There have been concerns about disparities in access to the internet almost since its inception – leading to the term *digital divide* (Sparks, 2013). In 2001, the Organisation for Economic Co-operation and Development (OECD) described the digital divide as

> *"…the gap between individuals, households and businesses and geographic areas at different socio-economic levels with regard to both their opportunities to access information and communication technologies (ICTs) and to their use of the internet for a wide variety of activities"* (OECD, 2001) p. 5.

Initially, debate around the digital divide was centred on physical access to and adoption of the internet, known as a 'first level digital divide'. However beyond this gap in access, the 'second level digital divide' describes differences in internet use, skills and literacy (Friemel, 2016).

Internet access varies greatly across different socio-demographic variables, including income, education, sex and age (Zickuhr & Smith, 2012). There is also a large urban/rural divide

in internet use in the United States. In 2018, 78% of adults living in rural communities use the internet compared with 90% living in suburban and 92% living in urban areas (Center, 2018).

There has been a dramatic increase in the use of computers and the internet in adults aged 65 years and over in the United States (Chang, McAllister, & McCaslin, 2015). This is especially important in the audiological context, given than the average age of hearing aid uptake in the United States is 63.3 years – and is typically preceded by 13 years of awareness of deteriorating hearing prior to seeking help (Abrams HB, 2015). Predictors of internet use in adults in this population include presence of a computer at home, a current or previous job requiring computer use, age, level of education and non-Latino ethnicity (Chang et al., 2015). As well as using the internet for social reasons, older adults use the internet to access health-related information or services, find out information about health issues, access medications and communicate with health care providers (Wagner, Hassanein, & Head, 2010).

Internet use in older adults is heavily skewed towards those in their 60's (Friemel, 2016) Many authors predict that the rapid dropping off of internet use in persons over 70 is a temporary, cohort effect; and will disappear over time as current internet users age (Chang et al., 2015; Friemel, 2016). However Friemel (2016) showed that the rapid decline in internet use, especially over the age of 85, is largely due to physical constraints such as eyesight, hearing or dexterity issues. Thorén et al. (2013) found higher rates of internet use in Swedish adults aged 65 years and over with hearing impairment, compared with Swedish adults in the same age cohort without hearing impairment. These authors propose that the internet may offer a valuable means of hearing rehabilitation that older adults can offer from home. However given the findings of Friemel (2016) these suggestions need to be interpreted with caution, and awareness that

computer and internet use may be inaccessible due to other disabilities, especially in those aged over 85 years.

A survey of older adults showed those aged 63 – 74 years who reported a slight hearing difficulty were more likely to use a computer and the internet, than those who reported no hearing difficulty. However those with moderate or more severe hearing difficulties were less likely than those with no hearing difficulties to use computers and the internet (Henshaw, Clark, Kang, & Ferguson, 2012). The authors suggest that internet may provide suitable means of delivering hearing screening, information and support to adults aged 50 – 74 years with mild hearing impairment, who would not normally seek services from an audiologist (Henshaw et al., 2012).

People who are deaf or hard of hearing may face fewer technical accessibility barriers than those with other disabilities (Dobransky & Hargittai, 2016). However, hearing impairment often co-occurs with other health conditions and disabilities. Hearing impairment in persons aged 65 years and over is associated with having multiple chronic health conditions (McKee, Stransky, & Reichard, 2017). An estimated 1.5 million Americans aged 20 years or older have combined vision and hearing loss (Swenor, Ramulu, Willis, Friedman, & Lin, 2013)

Persons with disabilities (with the exception of deafness or hearing impairment) are less likely than those without disabilities to use the internet (Dobransky & Hargittai, 2016). In 2011, Fox (2011a) found that fewer than half of adults with a disability used the internet to find health information. Disability status tends to intersect with other disadvantaged positions in society, further multiplying exclusion. A disproportionate number of people with disabilities have lower socioeconomic status and or are from racial minorities. (Brault, 2012) (Warner & Brown, 2011). Atcherson et al. (2014) highlight that disparities in internet access correspond with many health

disparities. This means that people who need internet-based health information the most, are the most likely to experience barriers to accessing and using it.

## Readability of hearing health information on the internet.

### *Readability.*

Readability describes how difficult, or easy a given text is to read and understand (Freda, 2005). When material is written at a higher reading level than that of the person reading it, they are likely to stop reading (DuBay, 2004). The readability of health information is of particular concern, given that the average reading level of adults in the United States corresponds to 8 -9 years of education, and about one in five read at the 5$^{th}$ grade level or below. For older persons aged 65 and over and inner-city minorities, almost two out of five persons reads at a 5$^{th}$ grade level or lower (Doak, Doak, & Root, 1996). People at all literacy levels prefer, and can better understand simple rather than more complicated written material (Ley, Jain, & Skilbeck, 1976). The recommended maximum reading grade level (RGL) of health material is 6 (Weiss, 2003).

In regard to health information presented on the internet, there is evidence that reading material on a screen is a different process to reading hardcopy printed material, for example that reading on screen is slower (Leu et al., 2011). Differences in how written material is processed by readers when presented online could potentially act as a further disincentive to low-skilled or unconfident readers.

### *Readability measures.*

There are a multitude of tests available to measure the readability of different texts. Many assign a numeric value to the analysed text, which corresponds to academic grade level in the United States (McInnes & Haglund, 2011). This numeric value is intended to reflect the number

of years of education required to read and understand the material (Wong & Levi, 2017). Readability formulas have been popular tools to predict the readability of written material since the 1920s. Between the 1980s and 2000s alone, there were over two hundred new readability formulas created and over a thousand studies related to readability formulas (DuBay, 2004).

Despite their popularity, there are a number of critiques of RGL measures. There is no agreed standard for choosing which readability formulas to use when (Breese & Burman, 2005). They are based on mathematical formulas, and do not reflect many other important factors that contribute to readability, including layout, typography used of jargon and illustrations (Hayden, 2008). Many formulas are based on outdated or irrelevant source data, or are used for purposes other than those they were designed for (Redish, 2000). Measures of RGL also do not provide information on whether material is understood or is useful to readers (Redish, 2000).

Nevertheless, RGL measures are important and useful tools for authors and reviewers. They are objective, quick and easy to use, and many word processing software packages (including Microsoft Word) include RGL measures (McInnes & Haglund, 2011). While low RGL scores do not guarantee that material is easy to comprehend or is of high quality, high RGL scores serve as a useful warning to authors that their content may be inaccessible to consumers (Redish, 2000).

### *Plain language.*

The plain language movement has influenced communication approaches in a wide range of fields, including business, the legal profession, and governments. Widespread concern in many countries about poor literacy levels, and specifically poor health literacy levels, has led to a focus on plain language in healthcare (Stableford & Mettger, 2007). This focus is reflected in several high level policy directives and statements calling for the adoption of plain language in

healthcare by bodies such as the Institute of Medicine (Kindig, Panzer, & Nielsen-Bohlman, 2004) and Agency for Healthcare Research and Quality (Berkman et al., 2004) in the United States, as well as the WHO (WHO, 2005).

Plain language exemplifies clear communication. Some critics falsely believe that plain language refers to just using simple words, or at worst the 'dumbing down' of information. In fact, plain language describes communication that engages and is accessible to its target audience (Stableford & Mettger, 2007). Using a plain language approach for text-based information incorporates evidence-based standards regarding structure, writing style and design to make reading easier. Text developed using a plain language approach is typically described as easy to read or user-friendly (Stableford & Mettger, 2007). Features of a plain writing style include short, clear and concise sentences and paragraphs. A friendly and conversational tone is used to engage with the reader, instead of a formal or scholarly tone of voice that may alienate them. A balance is found between technical information and the reader's needs and interests (Stableford & Mettger, 2007).

Partially in response to the recommendations in the Plain Writing Act (2010), the American Speech-Language-Hearing Association (ASHA) revised the content of its audiology-related consumer webpages in 2010 (Farrell, 2011). These revisions were analysed for changes in readability by Atcherson et al. (2014).

### *Health literacy.*

The term *health literacy* describes to what extent individuals can obtain, process and understand fundamental health information required to make suitable health decisions (Seiden, Zorn, Ratzan, & Parker, 2000). Health literacy incorporates the following skills: print literacy (to read and understand text, and find and understand information), numeracy (for tasks such as

understanding food labels, taking self-measurements, and following medication prescriptions), and oral literacy (to speak and listen effectively) (Berkman et al., 2011). Health literacy has a bigger impact on an individual's health status than age, income, employment status, level of education, or racial or ethnic background (Parker et al., 1999). Persons with low health literacy are at higher risk of having poor health than those with high health literacy (McInnes & Haglund, 2011). They also tend to overuse or misuse the healthcare system (Zarcadoolas, Pleasant, & Greer, 2009), and have higher hospitalisation rates (Parker et al., 1999). Persons with low health literacy in the United States spend an average of $7500 more on health care than those with higher health literacy per year, leading to an estimated $50 - $73 billion USD in additional health care costs per annum (Parker et al., 1999).

McCormack et al. (2010) added internet literacy as a core component of health literacy, given the increasing prevalence of health information and health information seeking on the internet. Consumers face several potential hurdles to utilising health information on the internet. They may have limited internet literacy, and have difficulties using a computer and internet browser to seek and find information. They may not have the skills needed to make judgments about the reliability and accuracy of information they do find. Additionally, they may not have sufficient health literacy skills to utilise and act on the information they do find, even if it is accurate (Atcherson et al., 2014).

***Readability of hearing health information on the internet.***

In a recent systematic review of studies of the readability of hearing health information on the internet, (Laplante-Levesque et al., 2015) found that the mean RGL of material was 9 to over 14 – meaning persons with hearing impairment and their significant others need at least 9 to 14 years of education to access internet based information on hearing health. Other studies of

internet-based hearing health information have found similar results (Laplante-Lévesque, Brännström, Andersson, Lunner, et al., 2012; Laplante-Levesque et al., 2015; Manchaiah et al., 2018; Ritchie, Tornari, Patel, & Lakhani, 2016; Seymour, Lakhani, Hartley, Cochrane, & Jephson, 2015).

## Quality of hearing health information found on the internet.

### *Consumer assessment of quality of health information.*

The internet is an equally powerful means of disseminating both high and low quality health information. Source credibility has been advocated for as a primary means for consumers to judge the quality of health information. A credible source is considered to be recognised expert, that maintains current information, and has no competing interests in providing information (Bates, Romina, Ahmed, & Hopson, 2006). Health consumers have been shown to make little use of source credibility, which could be considered a function of poor health literacy (Bates et al., 2006). Bates et al. (2006) encourage reputable health organisations to embrace search engine optimisation and promote themselves as higher-quality 'brands' than generic websites.

Older adults may be at increased risk of being exploited or getting misinformation from internet sources due to their limited understanding of and education on the internet (Grimes, Hough, Mazur, & Signorella, 2010). Gauld (2011) found that older adults in Australasia were more likely than younger adults to judge health information they found on the internet to be reliable, yet were less likely to check website provider credentials.

### *Quality measurement tools.*

There are a multitude of tools available to assess the quality of health information on the internet. A total of 273 unique instruments were identified in a study published in 2005 (Bernstam, Shelton, Walji, & Meric-Bernstam, 2005). The authors concluded that few of these were practically usable by health information consumers: only 29% of the instruments included publicly available evaluation criteria, and only 8.7% had 10 or fewer items that a user has to assess to make judgements about a website. Seven instruments contained items that could all be objectively evaluated. Of these seven instruments, only one showed robust inter-rater reliability and one other met readability standards (Bernstam et al., 2005).

A tool widely used in the literature to assess the quality of written health information is DISCERN (Charnock, Shepperd, Needham, & Gann, 1999). DISCERN was developed to support health consumers and information providers determine the quality of written information about different treatment choices for a given health condition (Charnock, 1998), in response to directives and a commitment to informing and empowering users of the National Health Service in the United Kingdom (Charnock et al., 1999). The tool itself was developed in an iterative process by an expert panel, with input from information providers and self-help group members (Charnock et al., 1999). The final tool consists of 15 quality criteria, and an overall quality rating (Charnock et al., 1999). Each question is rated on a 5 point scale, ranging from 'no' to 'yes'. Irrelevant questions may be skipped, for example item number 12 – '*does it describe what would happen if no treatment is used?'* in the case of labour and childbirth. However the instrument is designed to be used in its entirety to give a comprehensive analysis of quality. Hints of things to consider when assigning a rating score are provided with each item (Charnock, 1998).DISCERN has successfully been applied to a range of material available on a wide range of health topics, including epilepsy (Cerminara, Santarone, Casarelli, Curatolo, & El Malhany, 2014), clubfoot

(Kumar, Subramani, Veerapan, & Khan, 2014), chronic pain (Kaicker, Debono, Dang, Buckley, & Thabane, 2010), and chemotherapy (Som & Gunawardana, 2012). DISCERN scores show good inter-rater reliability (Rees, Ford, & Sheard, 2002).

The DISCERN instrument has also been utilised in several previous studies of the quality of hearing health information. These studies have consistently shown that the quality of hearing health information on the internet varies widely, and shows poor correlation with readability scores. That is, internet-based information on hearing health may be accessible to a wide range of reading levels, but the information contained within them may be of low quality – and vice versa (Ritchie et al., 2016). In a study of 66 websites of hearing health information in English, Laplante-Lévesque, Brännström, Andersson, and Lunner (2012) found that DISCERN scores varied from 1.13 to 3.93, with a mean of 2.04. Websites produced by not-for-profit organisations showed higher DISCERN scores than those produced by commercial business or government organisations (Laplante-Lévesque, Brännström, Andersson, & Lunner, 2012). Quality scores of the websites measured using DISCERN were found to be unrelated to readability scores of the same material. These trends were also seen in studies of internet-based information on glue ear (Ritchie et al., 2016) and tinnitus (Manchaiah et al., 2018). A study assessing the content and quality of tinnitus information on websites preferred by general practitioners showed a range of DISCERN scores from 2.5 – 3.5, with an overall mean score of 2.93. Possible DISCERN scores range from 1 to 5. Mean overall DISCERN scores of less than three suggest that much of the consumer hearing health information currently available fails to meet several important quality markers. These shortcomings correspond to *serious shortcomings* in quality according to the DISCERN handbook.

**Study rationale**

In response to the Atcherson et al. (2014) article, this study was carried out to investigate whether the application of plain language principles to Audiology Information Series (AIS) articles on the ASHA website has resulted in material that is easier to read, and will support patients in shared decision making regarding treatment choices.

## Aims and hypotheses.

### *Aims of this study.*

1. To examine the readability in mean RGL of the ASHA AIS material in English, compared to the recommended RGLs for health material (RGL = 6),

2. To examine how well the revised ASHA AIS articles in English meet the quality markers for helping people make informed treatment choices using the DISCERN tool,

3. To examine the relationship between RGL and DISCERN tool scores for the ASHA AIS articles in English,

4. To determine if there has been a change in RGL of ASHA hearing health consumer articles in English over time,

5. To determine whether the readability of an article with a high RGL can be reduced to within recommended levels (RGL $\leq$ 6), while concurrently improving its DISCERN quality score.

***Study Hypotheses.***

It is predicted that:

1. The mean RGL for the ASHA AIS articles is significantly higher than 6 (determined using a directional one-sample t-test)

2. There is a significant negative correlation between the RGL and the DISCERN score for the ASHA AIS articles (determined using a directional Pearson's correlation),

3. There has been no significant change over time in the RGL of the ASHA AIS articles over time (determined using ANOVA),

4. The RGL of an ASHA AIS article with high RGL scores can be reduced to $\leq 6$ while concurrently improving its DISCERN quality score (determined using the F-K readability measure, and rated using the DISCERN tool by two blinded external reviewers).

# Chapter 2: Methods

## Materials

The articles analysed in this study were Patient Information Handouts from the ASHA Audiology Information Series, written in English, accessed from the Audiologists section of the ASHA website (retrieved 5th September, 2017 http://www.asha.org/aud/pei/ ). The inclusion criteria for this study was that articles be available in both English and Spanish at the time of data collection. Seven articles were excluded, and 32 articles were analysed. This study forms part of a larger study that assessed the same articles in Spanish and aimed to compare the results of the English and Spanish versions of the same articles. Ethical approval for this study not required as it did not require human participants.

## Procedure

### Quality measure.

The author and a second rater both calculated DISCERN ratings for each article. The two raters underwent a calibration exercise before deriving final scores for the articles used in this study *(*

*Figure 2)*. Rating approaches were calibrated by jointly rating three practice internet-based hearing health articles. Interpretation of the DISCERN criteria, and how these may be applied to the given articles was discussed. The two raters then independently determined DISCERN ratings for three additional practice articles. Scores were found to be in alignment. Minor differences in scoring approaches were discussed. The raters then independently determined DISCERN scores for each of the 32 articles.


*Figure 2.* Calibration, rating and verification of reliability process used to derive DISCERN article rating scores for 32 ASHA Information Series articles.

Overall rating scores for each article were derived from scores of 15 criteria of quality; including evidence of bias, treatment choice and sources of information used. The DISCERN tool, with associated criteria and sub-criteria, can be viewed at the following webpage: http://www.discern.org.uk/discern_instrument.php

**Readability measures.**

Readability was measured using the Windows-based software Readability Studio (Oleander, 2014). Readability Studio 2012.1 provides many commonly used readability measures for English (and Spanish) text. The four readability measures used in this study were F-K, Fry, Gunning-Fog and SMOG. In the absence of specific standards for the use of specific readability formulas (Breese & Burman, 2005), these formulas were chosen due to their frequent use within healthcare and audiology-specific research, thus enabling comparison with existing literature. These four measures all report readability in reading grade level (RGL), corresponding to number of years of schooling in the United States. The four measures differ in the parameters measured to derive RGL for measured texts. The use of multiple measures of RGL also enabled comparison and cross-check of results. The formulas presented below were obtained from the Oleander Readability Studio Software Guide (Oleander, 2014).

***Flesch-Kincaid Grade Level Formula (F-K).***

The F-K formula was developed for use with technical documents, such as manuals and forms. The reported RGL indicates the number of years of schooling required to understand the given text, assuming 75% comprehension. The RGL is calculated using the following formula (adapted from Kincaid et al., 1975):

$$Grade = 0.39\left(\frac{Total\ Words}{Total\ Sentences}\right) + 11.8\left(\frac{Total}{Total\ Words}\right) - 15.59$$

***Fry.***

The Fry formula (Fry, 1968), determines RGL by calculating the average number of sentences and syllables in a passage. Results are plotted on a standardised graph of RGL to determine the approximate grade level of the material (*Figure 3).* Unlike most formulas which are validated against comprehension tests or a Cloze procedure, estimates of RGL using the Fry formula are based on publisher-recommended ratings of books, which means that the estimates can be difficult to interpret (Wang, Miller, Schmitt, & Wen, 2013). Despite this limitation, the Fry formula is popular because it is widely used in the reading literature, and does not require a large sample (Doak et al., 1996).

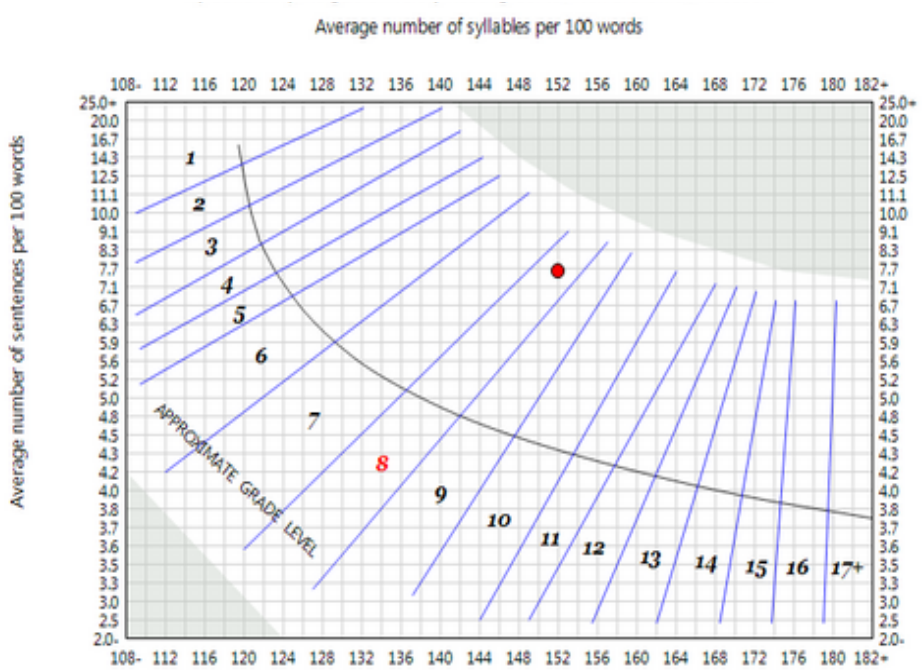



*Figure 3:* Readability Graph, showing an example calculation resulting in a Reading Grade Level of 8. Adapted from: Fry (1968).

***Gunning Fog (FOG).***

Unlike some other unlike some other readability measures, including the F-K, the FOG formula incorporates the number of multisyllabic words – which are considered hard to read (Zraick, Atcherson, & Ham, 2012) .The RGL is calculated using the following formula (adapted from Gunning, 1952):

$$Grade = 0.4\left[\left(\frac{Words}{Sentences}\right) + 100\left(\qquad\frac{Words}{Words}\right)\right]$$

***Simple Measure of Gobbledygook (SMOG).***

The SMOG formula is useful for most texts. Unlike most formulae which test for between 50 – 75% comprehension, SMOG tests for 100% comprehension (Klingbeil, Speece, & Schubiner, 1995). This means SMOG is particularly useful for healthcare information, as even a small degree of misunderstanding can lead to poorer health outcomes (Wang et al., 2013). The RGL produced by SMOG indicates the grade level in which an average student can read and comprehend the text. The SMOG measure is calculated by selecting 10 consecutive sentences from each of the beginning, middle and end of text. The total polysyllabic word count from these thirty sentences is then applied to a SMOG conversion table to determine the associated reading grade level (Kahn & Pannbacker, 2000). This calculation can be visualised using the following formula (adapted from Mc Laughlin, 1969):

$$Grade = 1.0430\sqrt{Number of}\qquad x\frac{30}{Number\ of\ Sentences} + 3.1291$$

**Article revision**

To demonstrate the feasibility of improving both the quality and readability of articles, the article with the poorest quality measure and highest mean RGL was revised. On this basis, the AIS article *Tips for Improving your Listening Experience* was re-written with the aim to improve both quality and readability. This revision incorporated criteria items from the DISCERN tool, including the inclusion of authorship and publication date, and transparency of information sources used. Several writing techniques were used to covey variance in individual suitability for different treatment choices and potential outcomes. Quantifiers were substituted

for absolute statements, for example ‘some people with hearing impairment’ instead of ‘everyone’. Modal verbs such as ‘will’ and ‘may’ were utilised to convey uncertainty.

Principles of readability were also applied, including avoiding the use of jargon, minimising sentence length and multisyllabic words (Doak et al., 1996). Care was taken to maintain the inherent content and structure of the original article. The original and revised articles were rated by two external raters familiar with the DISCERN tool. The raters were blinded as to which article was the original, and which was the revised version. The raters also provided subjective feedback on whether the content of the original version was preserved. Individual criteria and overall score ratings were provided, to enable a qualitative comparison of difference in quality between the two versions. The readability of both the original and revised versions was calculated using the F-K formula in Microsoft Word 2016.

**Statistical analyses**

Mean DISCERN scores and mean RGL scores were calculated in Microsoft Excel 2016. Further analyses were conducted using SPSS for Windows, Version 25.

**Quality.**

The inter-rater reliability of the overall DISCERN scores for the articles was assessed using the intra-class coefficient (ICC) and Cronbach’s Alpha in SPSS. The kappa generated from the ICC provides an indication of inter-rater reliability by indicating “*the proportion of agreement corrected for chance*” (p.613, Fleiss and Cohen, 1973). The kappa value ranges from 0 to +1, with values greater than 0.75 representing excellent agreement between raters beyond chance, and values between .40 and .75 representing fair agreement beyond chance (Fleiss, 1981). The ICC assesses the reliability of coding by using an analysis of variance. A two-way mixed model was selected for this analysis because the DISCERN scores were derived from the

same two raters for each article. The overall measure result was used as the reliability analysis for the mean DISCERN scores for each article, rather than each individual DISCERN item.

Descriptive statistics were calculated to determine the mean and distribution of quality scores of the articles.

### Readability.

Descriptive statistics were calculated to determine the mean and distribution of the RGL scores of the articles. Directional one-sample t-tests were conducted to determine if the mean RGLs for each RGL measure were significantly higher than 6 – the recommended maximum RGL for health material (Weiss, 2003).

Two univariate ANOVA were used to compare the RGL of the articles over time, using historical data from the Atcherson et al. (2014) study and data from the current study. Three time-points were identified: (1) pre-2011; (2) 2011 update; (3) current study. Two RGL measures were used in both Atcherson et al. (2014) and the current study: F-K and FOG. The first ANOVA assessed the mean F-K RGL over time; second ANOVA assessed the mean FOG RGL over time.

### Relationship between Quality and Readability.

Directional Pearson's correlation was calculated to determine the relationship between respective RGL and DISCERN scores. Because a statistically significant outlier was found in the SMOG RGL scores, a Spearman's rho was calculated for these data.

# Chapter 3: Results

## Quality

Intra-rater reliability was highly consistent (α= 930). Scores from both raters showed excellent agreement beyond chance (Fleiss, 1981), k = .869 (95% CI, .748 to -.934).

The overall mean quality score was 2.93 (*SD* = .816). There was a wide range in quality between the articles (Min. = 1.13, Max = 4.50) (Figure 4).

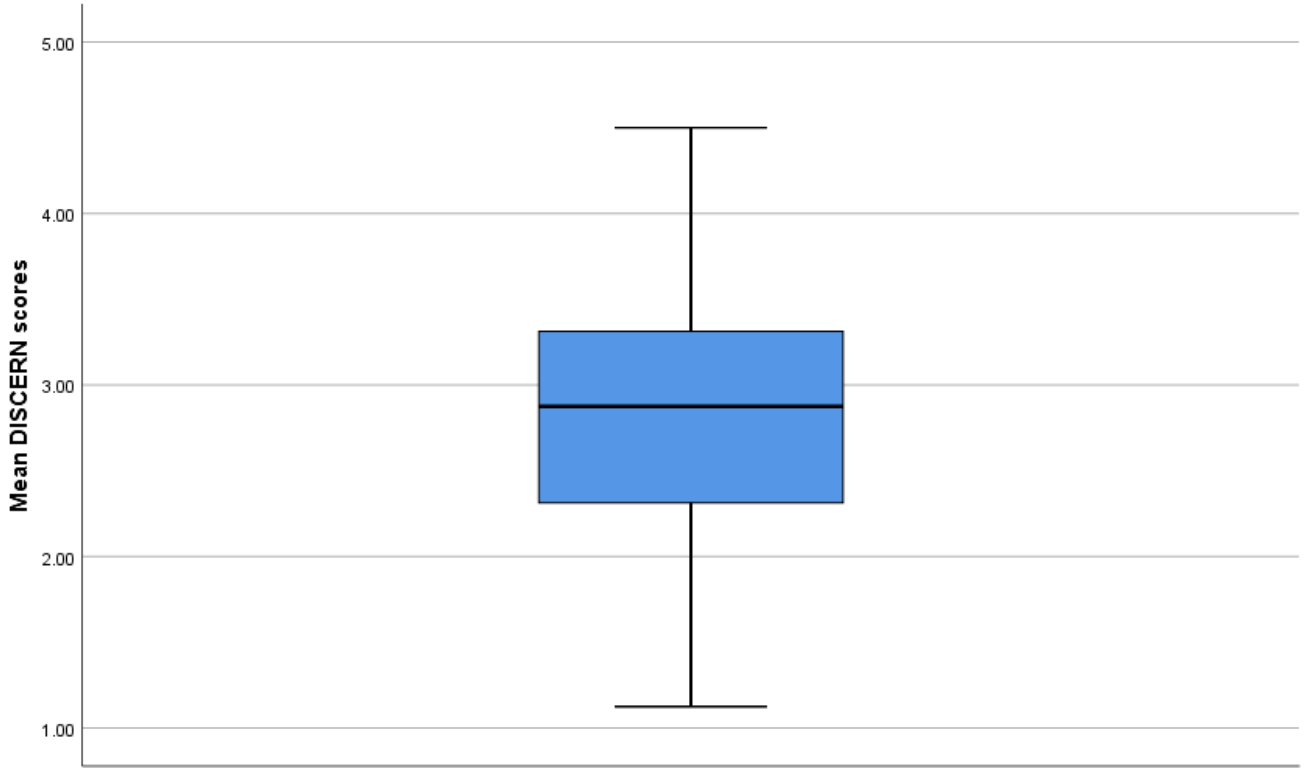



*Figure 4:* Distribution of mean DISCERN quality scores. The horizontal line within the box indicates the median, boundaries of the box indicate 25th and 75th percentiles, and whiskers indicate the highest and lowest values.

**Readability**

Mean RGL scores of the articles are shown in ***Figure 5***. These varied from a mean RGL of 9.41 (SD = 2.24) measured using F-K, to 11.07 (SD = 2.50) using SMOG. The SMOG results also showed the largest range in scores, and contained an outlier article that had a RGL significantly lower than the remainder of the scores (*Figure 5*).

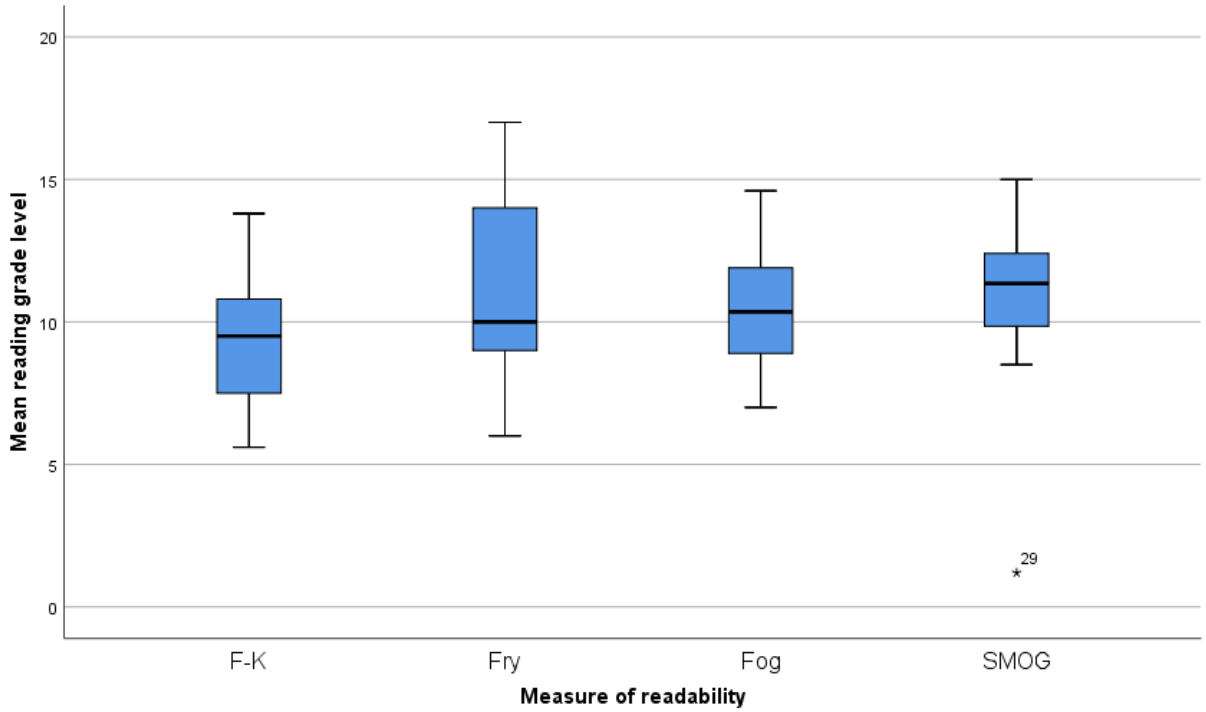



*Figure 5:* Distribution of reading grade level (RGL) scores using four readability measures: Flesch-Kincaid Grade Level (F-K), Fry, Gunning Fog Index (Fog) and Simple Measure of Gobbledygook (SMOG). The horizontal line within the box indicates the median, boundaries of the box indicate 25th and 75th percentiles, and whiskers indicate the highest and lowest values, excluding significant outliers.

Directional one-sample t-tests showed that overall mean RGL was significantly higher than the recommended maximum of 6 for all measures of readability used (*Table 2*).

*Table 2:* Difference of overall RGL scores from the recommended maximum of 6, for F-K, Fry, FOG and SMOG measures.

| Readability measure | *M* | *SD* | *n* | Comparison Value | 90% CI for Mean Difference | *t* | *df* | *p* |
|---|---|---|---|---|---|---|---|---|
| F-K | 9.41 | 2.24 | 32 | 6 | 2.74, 4.08 | 8.61 | 31 | < .000 |
| Fry | 11.06 | 3.32 | 32 | 6 | 4.07, 6.06 | 8.62 | 31 | < .000 |
| Fog | 10.38 | 2.18 | 32 | 6 | 3.73, 5.04 | 11.40 | 31 | < .000 |
| SMOG | 11.07 | 2.50 | 32 | 6 | 4.33, 5.8 | 11.51 | 31 | < .000 |

**Relationship between quality and readability**

No significant relationship was found between DISCERN score and RGL for F-K ($r$ = 0.77, $n$ = 32, $p$ = .337) Fry ($r$ = .104, $n$ = 32, $p$ = .285) or FOG ($r$ = .082, $n$ = 32, $p$ = .329) readability measures using Pearson's Product Moment Correlation analysis. Spearman's rank-order correlation was calculated to determine the relationship between DISCERN and SMOG scores. No significant relationship was found ($r_s$ = .152, $p$ = .203).

**Comparison with previous studies**

Two RGL measures used in this study, F-K and FOG, were previously used to examine the readability of ASHA audiology consumer information articles in a study by Atcherson et al. (2014).

Univariate ANOVA showed a significant change in F-K RGL over time: $F$ (2,130) = 2.93, $p$ = .05, $\eta^2$ = .04. Post-hoc testing using a LSD correction revealed the mean F-K RGL was significantly higher for the pre-2011 webpages than the 2011 update webpages ($p$ = .02), but no

significant differences were found between the mean F-K RGL for the 2011 update webpages and the webpages in the current study ($p$ = .42) or between the F-K RGL for the pre-2011 webpages and the webpages in the current study ($p$ = .16).

Univariate ANOVA of FOG RGL over time also indicated a significant change over time: $F$ (2,130) = 7.11, $p$ = .001, $\eta^2$ = .10. Post-hoc testing using a LSD correction revealed the mean FOG RGL was significantly higher for the pre-2011 webpages than the 2011 update webpages ($p$ = .006) and the webpages in the current study ($p$ < .001). However, there was no significant difference between the mean FOG RGL for the 2011 update webpages and the webpages in the current study ($p$ = .11).

**Revised article**

The two external reviewers provided qualitative feedback that the revised article retained the content and intent of the original. While the ratings of the two versions cannot be compared statistically, the mean quality score improved from 2.5 (original article) to 4.25 (revised article) out of 5. Overall scores and ratings for individual criteria are shown in

*Table 3* for comparison.

*Table 3:* Individual criteria and overall quality scores of original and revised article *Tips for Improving Your Listen Experience*

| Criteria | Mean DISCERN rating | |
|---|---|---|
| | Original article | Revised article |
| 1. Are the aims clear? | 3 | 4.75 |
| 2. Does it achieve its aims? | 4 | 4.75 |
| 3. Is it relevant | 4 | 4.75 |
| 4. Is it clear what sources of information were used to compile the publication (other than the author or producer?) | 1 | 5 |
| 5. Is it clear when the information used or reported in the publication was produced? | 3 | 5 |
| 6. Is it balanced and unbiased? | 3.5 | 4.25 |
| 7. Does it provide details of additional sources of support and information? | 1 | 5 |
| 8. Does it refer to areas of uncertainty? | 2 | 4.75 |
| 9. Does it describe how each treatment works? | 2.5 | 3.75 |
| 10. Does it describe the benefits of each treatment? | 2.5 | 3.75 |
| 11. Does it describe the risks of each treatment? | 1 | 2.5 |
| 12. Does it describe what would happen if no treatment is used? | 1.5 | 4.5 |
| 13. Does it describe how the treatment choices affect overall quality of life? | 3.5 | 3.5 |
| 14. Is it clear that there may be more than one possible treatment choice? | 2.5 | 5 |
| 15. Does it provide support for shared decision-making? | 1 | 4 |
| **16. Based on the answers to all the above questions, rate the overall quality of the publication** | **2.5** | **4.25** |

# Chapter 4: Discussion

## Introduction

The purpose of this study was to determine whether the application of plain language principles to AIS articles on the ASHA website has resulted in material that is easier to read, and supports shared decision making. Specifically, the readability in mean RGL was determined, and compared to the recommended RGL for health material. Changes in readability over time were assessed, using the two readability measures used in both the present study and that of Atcherson et al. (2014). The quality of ASHA AIS articles was also measured using the DISCERN tool, which is designed to assess the ability of written material to support patients to make informed treatment choices. The relationship between RGL and DISCERN tool scores was also examined. To demonstrate the feasibility of reducing the RGL of a given article while also improving its quality in regards to supporting informed treatment choices, the article with the highest RGL and lowest DISCERN quality score was re-written; incorporating principles of plain language and shared decision making.

## Readability

While there was some variance in mean RGL across the measures used, the mean RGL for all articles was significantly above the recommended RGL for health material across all four measures of readability. There was a wide range in variance of readability across the articles, which means that some patients are receiving information that is more accessible than others. The significantly high mean RGL level of the articles means that the language used is well above the literacy level of many of the patients receiving them (Doak et al., 1996). Such patients may misinterpret information, interpret instructions literally (with potentially negative consequences),

or lose motivation and cease reading the material (Doak, Doak and Root, 1996). These findings are consistent with previous studies of hearing health information on the internet (Laplante-Lévesque, Brännström, Andersson, Lunner, et al., 2012; Laplante-Levesque et al., 2015; Manchaiah et al., 2018; Ritchie et al., 2016; Seymour et al., 2015).

Analysis of changes in RGL over time for ASHA audiology consumer articles showed that for the F-K and FOG RGL measurements, improvements in mean RGL occurred during the 2011 update of the webpages. No further significant improvements in mean RGL occurred for the current webpages – that is, following the publication of Atcherson et al. (2014)'s findings.

**Quality**

The quality of articles varied widely, with a mean overall quality score of 2.93 out of 5. According to the DISCERN tool, scores less than 3 describe publications that are of 'low' quality with *serious or extensive shortcomings* (Charnock et al., 1999). None of the articles received an overall quality score of 5 out of 5, corresponding to high quality with *minimal shortcomings* (Charnock et al., 1999).

Common criteria for which articles frequently scored 1 or 2 out of 5, equating to 'No' or only a limited amount, were: 4. *Is it clear what sources of information were used to compile the publication (other than the author or producer)?* 7. *Does it provide details of additional sources of support and information?* 11. *Does it describe the risks of each treatment?* and 12. *Does it describe what would happen if no treatment is used?* (Charnock et al., 1999). Some articles also scored poorly against criteria 13 – *Does it describe how the treatment choices affect overall quality of life?* (Charnock et al., 1999). Clarity of information sources used is important for improving health literacy. Providing recommendations for (robust) additional sources of support

and information are directly important for supporting shared decision making. Failing to describe the risks of treatments, risk if no treatment is used and how treatments affect overall quality of life provide a limited and biased view of treatment options. This also does not help patients to understand the consequences of their decisions, as advocated for by Barry and Edgman-Levitan (2012).

With such a wide range of quality across the articles, patients with different hearing health conditions are receiving differing levels of quality of information to support their decision making regarding treatment choices – and some are receiving low quality information about their treatment choices. These findings are consistent with previous studies of internet-based hearing health information (Laplante-Lévesque, Brännström, Andersson, Lunner, et al., 2012; Manchaiah et al., 2018; Ritchie et al., 2016; Seymour et al., 2015).

An evaluation of internet based information on tinnitus showed mid-range DISCERN scores, however this study assessed websites favoured by General Practitioners (Fackrell, Hoare, Smith, McCormack, & Hall, 2012). The average quality of this information still showed that many websites had serious shortcomings, and failed to meet many important quality markers. This finding is concerning because it means that in general, doctors are recommending websites of only slightly higher quality than patients with tinnitus are likely to find themselves.

**Relationship between readability and quality**

No significant relationship was found between the readability and quality of articles. This finding demonstrates that readability in itself does not determine that health information articles will be of high quality – and vice versa. These findings are consistent with previous studies of internet-based hearing health information (Laplante-Lévesque, Brännström, Andersson, Lunner,

et al., 2012; Manchaiah et al., 2018; Ritchie et al., 2016; Seymour et al., 2015). These findings of the present study emphasise the importance of not solely relying on readability measures to determine the efficacy of patient information materials.

**Article revision**

The revision of the article *Tips to Improve Your Listening Experience* maintained the fundamental structure and content of the original article, while reducing the RGL to below the recommended level of 6 (Weiss, 2003) and also improving its quality. This exercise demonstrated the feasibility of improving the readability and quality of these existing articles. The mean quality ratings of the two expert external raters improved for almost all criteria between the original and revised articles. The criteria where the biggest improvements between the original and revised article scores were found were: clarity of information sources (Criteria 4), details of additional sources of support and information (Criteria 7) support for shared decision making (Criteria 15), and reference to areas of uncertainty (Criteria 8). Criteria 4 and 7 can be easily achieved by authors' inclusion of reference and external links to appropriate information sources. Support for shared decision making can be achieved by encouraging patients to consider their options and seek further input and support when making treatment choices. Reference to areas of uncertainty can be promoted by avoiding the use of absolute statements when discussing treatment choices, such as 'all patients will'.

**Clinical implications**

The finding that article readability scores were not significantly related to their quality was consistent with previous studies (Laplante-Lévesque, Brännström, Andersson, Lunner, et al., 2012; Manchaiah et al., 2018; Ritchie et al., 2016; Seymour et al., 2015). This also demonstrates that focusing on plain language, or readability in itself, is insufficient to ensure material is of high quality.

The high readability scores found mean that many of the articles will be inaccessible to many hearing health consumers. Such materials do not promote health literacy, SDM or reflect PCC. The large variance in readability and quality scores is also unethical – patients with different hearing health conditions are receiving very different levels of quality of information. Some of it fails to meet many quality markers and is biased. The provision of low quality consumer information materials could potentially damage patients' trust in their audiologist, which has been shown to be an important predictor of positive patient outcomes (Preminger, Oxenbøll, et al., 2015) . Low quality materials could also lead to damage in institutional trust in ASHA (Preminger, Oxenbøll, et al., 2015)

These findings are of particular concern given that almost all audiology patients have the communication disorder of hearing impairment. Providing information in a variety of formats, including written material, is of extra importance for this population. There is evidence that audiologists' verbal communication skills during consultations can make it even more difficult for patients to fully understand the information provided and participate in treatment plans. Audiologists are prone to 'information dumping' during consultations; overwhelming their patients with too much information at once (English, 2008). Sciacca, Meyer, Ekberg, Barr, and Hickson (2017) transcribed audiologists' speech during consultations and assessed its RGL.

They found that the RGL of audiologist's spoken language was significantly associated with hearing aid uptake. Patients were less likely to obtain hearing aids when audiologists' language was at a higher RGL. These findings both support the provision of high quality written material with a low RGL to expand on and support audiological consultations.

**Limitations of this study**

This study was subject to several limitations. Not all of the AIS articles were included in this study – seven (that were only available in English at the time of writing) were excluded from analysis. However it is unlikely that the inclusion of these articles would have affected the overall findings of this study. The readability and quality of the 32 articles analysed were highly variable, yet the mean RGL was consistently and significantly above the recommended level of 6, and the mean quality rating was in the mid-range of possible scores.

Readability is also only once aspect of accessibility. Audiology patients may have other conditions that affect their vision, cognition, mobility or dexterity. As such, audiology patients may require the information presented in the AIS articles in alternative formats, such as enlarged print or video, in order to be able to access them. Data from the U.S. National Health Interview Survey show that hearing loss in individuals over the age of 65 years is independently associated with a number of co-occurring health conditions, including arthritis and stroke. Presence of hearing loss is also associated with poorer health in the previous year and the presence of multiple chronic health condition (McKee et al., 2017). An estimated 1.5million Americans 20 years or older have combined vision and hearing loss (Swenor, Ramulu, Willis, Friedman, & Lin, 2013).

Readability does not directly correspond with comprehension. Patients may be able to read material, but not understand or make use of the information within it (Doak et al., 1996). It should be noted that comprehension is being tested, via a Cloze test (Taylor, 1953), in a companion study. This will elucidate the 'human element' that is missing from the current study.

A critical assumption implied in this study is that the provision of readable AIS articles of high quality would support shared decision making. If, when and how these articles are used in everyday audiological clinical practice remains unknown. As at 2014, when the original study by was published, the AIS articles were published under the *Information for the Public* section of the ASHA website homepage. In February 2018, when the articles assessed in the current study were accessed, the articles were located under the Audiology section of the website. Information for the public is situated under a much less prominent heading and not on the website homepage as in 2014. For patients who do read these articles, it is also unknown whether or not the material provided supports shared decision making in practice. Further research, incorporating a variety of methodologies, would be beneficial to better understand what materials ASHA can provide that will feasibly support shared decision making in audiological practice.

**Limitations of the tools used in this study**

The limitations of readability measures, especially those that create mathematically derived RGL measures such as those used in the present study, are well documented (Redish, 2000) . An example of a more comprehensive measure of the readability of written health material is the Suitability assessment of material (SAM) (Doak, Doak and Root, 1996). Within the SAM tool, scores are assigned to a comprehensive checklist of items under the high level topics of *Content, Literacy demand, Graphics, Layout and typography, Learning stimulation and*

*motivation*, and *Cultural appropriateness*. Reading grade level forms only one section of this assessment (under *Literacy demand*). Other contributors to readability, including use of graphics and layout (Hayden, 2008), are also encompassed.

The DISCERN tool is just one measure of health information quality, with associated benefits and limitations. It does not contain any criteria that specifically target the accuracy of the information provided. For example: information regarding outdated treatment options, that are no longer considered best practice, could potentially receive high quality scores if it is presented in an unbiased way with external references.

At the same time, the DISCERN tool is primarily aimed at health consumers, and one of its advantages is that it facilitates evaluation of the quality of information presented, without requiring advanced expertise in a given subject area. The broad applicability of the DISCERN tool is also useful in research. In the present study, the two raters of the ASHA AIS articles varied greatly in their levels of subject matter expertise – one was a graduate audiology student, while one was a university lecturer with extensive clinical experience. However both were able to consistently apply the tool and their scores showed excellent agreement beyond chance. There is also evidence that indicates that patients can use DISCERN, with reliable results (Batchelor & Ohya, 2009).

Ritchie et al. (2016) note that Likert-scale responses options in the DISCERN instrument create a degree of subjectivity – response option numbers 1, 3, and 5 are labelled 'No', 'Partially' and 'Yes' respectively. Response numbers 2 and 4 are not labelled, which makes it hard to distinguish which score is most appropriate.

**Recommendations for the American Speech-Language-Hearing Association**

Not for profit, professional organisations such as ASHA have an important part to play in improving health literacy and associated hearing outcomes. They can help do so by producing and making unbiased, accessible and high-quality hearing health information available for consumers and incorporating these materials into patient care. Based on the findings of this study, the following recommendations are proposed to ASHA and similar professional organisations:

1) **Revise existing Audiology Information Series Articles to reduce RGL and improve quality.**

The revision of the article *Tips for Improving Your Listening Experience* demonstrated the feasibility of re-writing the existing articles to both reduce RGL and improve quality. There are a plethora of existing guidelines for writers and producers of consumer health information that ASHA could utilise, for example: *A guide to Creating and Evaluating Patient Materials: Guidelines for Effective Print Communication* (MaineHealth, 2010). The DISCERN tool itself may be used as a checklist for writers, and also a training tool for health professionals and patients to improve communication and promote shared decision-making (Charnock, 1998). The revision exercise demonstrated that the DISCERN tool is relatively quick and easy to apply, and could be utilised in these contexts.

2) **Ensure future authors adhere to readability and quality standards**

It is recommended that ASHA formally require authors to ensure that the RGL of consumer material to be < 6 to maximise accessibility. A quality measure such as DISCERN should also be

utilised in the development of consumer materials, and used to check suitability before publication. More comprehensive assessment tools could also be utilised – such as SAM (Doak et al., 1996).

Adopting these requirements would reduce work for the organisation by eliminating the need to revise and republish material that has a high RGL and is of low quality. Implementing these publication requirements will also help avoid damage to institutional trust in ASHA (Preminger, Oxenbøll, et al., 2015) and trust in the clinicians distributing the material.

**3) Promote source credibility of ASHA material and utilise search engine optimisation**

Tensions can arise in the field of audiology due to corporate pressures to sell hearing aids and other devices in clinical settings. As an impartial, professional organisation, ASHA is ideally placed to promote itself as a credible source of unbiased information of high quality to hearing health consumers (Bates et al., 2006). The ASHA should also utilise techniques such as search engine optimisation to make its consumer information easier to find and more likely to be read. This is especially important as health consumers typically use internet search engines to find information and only read the first few results, regardless of their source credibility (Bates et al., 2006; Peddie & Kelly-Campbell, 2017).

**4) Conduct further research to understand what materials support SDM in audiology**

Further research should be conducted to better understand how the current AIS materials are being used by consumers, and in audiological practice. The format and content of materials that best support shared decision making should also be explored. This research needs to be relevant to clinical contexts in the United States, especially as much of the research in this area has been carried out in Australia (e.g. Laplante- Lévesque et al., 2010).

## Conclusion

The readability and quality of the current ASHA AIS articles are highly variable, and many articles are likely to be inaccessible to audiology patients and not support shared decision making. No significant relationship was found between the readability and quality of articles. These findings are consistent with previous studies of health consumer information on the internet, including those related to hearing health.

The readability and quality measures of the AIS articles are inconsistent with the principles of SDM and PCC. Provision of low quality consumer information materials may erode patient trust in their audiologist and their treatment recommendations. Poor quality consumer information materials may also damage consumer institutional trust in ASHA. All of these factors have the potential to impair patient outcomes.

Readability measures have well-documented limitations, however may serve as a practical tool to ASHA authors when developing consumer information material. Additionally, consistent application of some form of quality checklist, such as the DISCERN tool, may result in consumer resources that are of higher quality and be more likely to support shared decision making. Further research is required to understand how and when these articles are used in audiological practice, and if they support shared decision making regarding treatment choices.

**Appendix**

**Revised ASHA AIS article**

**(**The original article can be viewed at **http://www.discern.org.uk/discern_instrument.php ).**

---

AMERICAN SPEECH-LANGUAGE-HEARING ASSOCIATION

AUDIOLOGY Information Series

# Communication Skills: Tips for Easier Listening

*Aubrey Jones, AuD, CCC-A*
*Director, Better Hearing Associates.*
*Revised: January 2018*

---

Many people think listening problems are just due to poor hearing. However, lots of things can cause communication breakdowns.

This article describes ways to help avoid communication problems. It also describes some communication problems for adults with hearing loss. You will find some tips that may help. Links for more help and support are included.

## Things that can make it hard to understand speech:

- Heavy accent
- Unclear speech
- Background noise
- Dim lighting
- Unfamiliar topic
- Tiredness
- Sickness
- Trouble paying attention
- Language problems

## Things that may make it easier to understand speech:

Everyone can benefit from good communication skills. These are extra important if you have a hearing loss. Good communication can help ensure you don't miss out on socializing.

**How to make communication easier from the beginning:**

- Tell others you have a hearing loss.
- Ask the other person to get your attention before talking. This can help ensure you don't miss information. It can also help to see the speaker's face while they are talking.
- Ask the other person to tell you when the topic changes. This can help keep track of the conversation.
- Find a quiet, well-lit room to talk. Less background noise will make listening easier. A clear view of their face will help speechreading.
- Stand or sit 3-6 feet from the speaker. This will help ensure speech is at a normal volume. It will also help you see the speaker's face.

**Help keep the conversation going.**

- Tell the person talking if you don't understand.
- Try asking them to rephrase what has been said.
- Ask them to simplify what they are saying. Shorter words and sentences are easier to understand.
- Ask the speaker to repeat the part that you did not get.

It's better to make a specific request, rather than saying 'what' or 'huh'[i].

Pretending to understand when you don't can create problems. It can also make people feel embarrassed.

Check what you heard by repeating the message back. Ask the speaker to write down important details. For example, ask your doctor to write down appointment times.

## Tips for common communication problems

### Problem: It's hard to understand the speaker.

Suggestions:

- Ask the speaker to speak slowly
- Ask the speaker not to shout
- Ask the speaker to look directly at you.

Some people think that shouting at a person with hearing loss will help. Shouting can distort lip-patterns and speech. Some people with hearing loss find loud sounds painful[ii].

### Problem: Background noise is too loud.

Suggestions:

- Move to a quieter location.
- Pick a quiet restaurant and go at an off-hour when it will be less noisy.
- Turn off or move away from radios, televisions, or dishwashers.

Tip: Some restaurant reviews provide information on noise levels. Have a look when choosing a restaurant.

### Problem: Room lighting is dim.

Suggestions:

- Try to improve the lighting in the room. Or, find another room with good lighting.
- Sit with a window at your back facing the speaker. This makes it easier to see the speaker's face.

Tip: People understand better when they can see the speaker's face[2].

### Problem: Room acoustics are poor.

Suggestions:

- Choose soft floor coverings, window coverings, and furniture for your home. These will help absorb sounds. This can make it easier to hear a person talking.
- When dining out, choose restaurants with carpets, curtains, tablecloths, and booths. Avoid restaurants that have hard floors and bare walls. These can increase background noise.

### Problem: You don't know the topic of the conversation

Suggestions:

- Ask someone to summarize the topic of conversation.

- Ask the speaker to tell you when the topic changes.
- Ask a yes/no question.
- If possible, prepare for the conversation ahead of time. Think about the words that may be used.

**Problem: You are tired and stressed. It is hard to pay attention.**
Suggestions:

- Set sensible goals.
- Ask to have short breaks in meetings.

Tip: People with hearing loss are likely to feel more fatigued. This is because they work harder to listen[iii].

## What else might help?

You may benefit from hearing devices such as hearing aids. Assistive listening devices can also help some people. You may also benefit from other communication modes. These can include Seeing Essential English or American Sign Language.

## What if I don't do anything about my hearing loss?

Untreated hearing loss can cause loneliness. It can also lead to depression and other effects[5].

# Where can I get more help?

### An ASHA audiologist

Many audiologists offer communication training. This training can make you more aware of communication problems. It can also help your listening and speechreading skills. This type of training can improve communication skills whether you wear hearing aids or not.

Audiologists can also work with the key people in your life, like your family. It can be helpful to ask your family for their input, too. Tell your audiologist what activities you like to do. Also let them know whom it's important for you to communicate with.

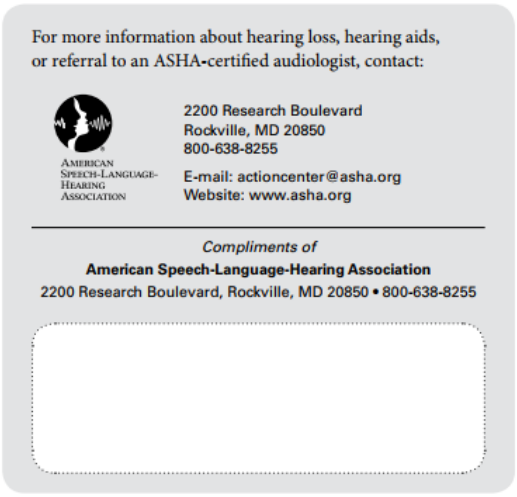
Look for an audiologist certified by the American Speech-Language-Hearing Association (ASHA). You can find an audiologist in your area by searching on the ASHA website: www.asha.org/profind/

ASHA
2200 Research Boulevard
Rockville, MD 20850
800-638-8255
E-mail: actioncenter@asha.org
Website: www.asha.org

### Peer support

The HLAA provides help and resources for people with hearing loss and their families. It has 14 state organizations and 200 local chapters.

Hearing Loss Association of America
7910 Woodmont Avenue, Suite 1200
Bethesda, MD 20814
301-657-2248 (Voice/TTY)
www.hearingloss.org



## Further reading

Better Hearing: Communication Strategies

http://www.betterhearing.org/hearingpedia/counseling-articles-tips/communication-strategies

## References

Caissie, R., & Gibson, C. L. (1997). The effectiveness of repair strategies used by people with hearing losses and their conversational partners. *Volta Review, 99*(4), 203-218.

[2] Sumby, W. H., & Pollack, I. (1954). Visual contribution to speech intelligibility in noise. *Journal of the Acoustical Society of America, 26*, 213-583.

[3]Moore, B. C. J. (2007). *Cochlear hearing loss: Physiological, psychological and technical issues* (2nd;2. Aufl.;2; ed.). Chichester;Hoboken, N.J: John Wiley & Sons.

[4]Wang, Y., Naylor, G., Kramer, S. E., Zekveld, A. A., Wendt, D., Ohlenforst, B., & Lunner, T. (2017). Relations between self-reported daily-life fatigue, hearing status, and pupil dilation during a speech perception in noise task. *Ear and Hearing,* 10.

[5]Arlinger, S., Linköpings universitet, Teknisk audiologi, ÖNH - Öron- Näsa- Halskliniken, Hälsouniversitetet, Institutionen för nervsystem och rörelseorgan, . . . Östergötlands Läns Landsting. (2003). Negative consequences of uncorrected hearing loss-a review. *International Journal of Audiology, 42*(S2), 17-20.

## References

Abrams HB, K. J. (2015). An Introduction to MarkeTrak IX: A New Baseline for the Hearing Aid Market. *Hearing Review, 22*(6), 16.

Amante, D. J., Hogan, T. P., Pagoto, S. L., English, T. M., & Lapane, K. L. (2015). Access to care and use of the internet to search for health information: Results from the US National Health Interview Survey. *Journal of Medical Internet Research, 17*(4), e106.

Atcherson, S. R., DeLaune, A. E., Hadden, K., Zraick, R. I., Kelly-Campbell, R. J., & Minaya, C. P. (2014). A Computer-Based Readability Analysis of Consumer Materials on the American Speech-Language-Hearing Association Website. *Contemporary Issues in Communication Science and Disorders, 41*(Apr), 12-23.

Barak, A., & Sadovsky, Y. (2008). Internet use and personal empowerment of hearing-impaired adolescents. *Computers in Human Behavior, 24*(5), 1802-1815.

Barry, M. J., & Edgman-Levitan, S. (2012). Shared decision making - The pinnacle of patient-centered care. *New England Journal of Medicine, 366*(9), 780-781.

Batchelor, J. M., & Ohya, Y. (2009). Use of the DISCERN instrument by patients and health professionals to assess information resources on treatments for asthma and atopic dermatitis. *Allergology International, 58*(1), 141-145.

Bates, B. R., Romina, S., Ahmed, R., & Hopson, D. (2006). The effect of source credibility on consumers' perceptions of the quality of health information on the Internet. *Medical informatics and the Internet in medicine, 31*(1), 45-52.

Berkman, N. D., DeWalt, D. A., Pignone, M., Sheridan, S. L., Lohr, K. N., Lux, L., . . . Arthur, J. (2004). Literacy and health outcomes. Evidence report/technology assessment No. 87.

Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., Viera, A., Crotty, K., . . . Harden, E. (2011). Health literacy interventions and outcomes: an updated systematic review. *Evidence report/technology assessment*(199), 1-941.

Bernstam, E. V., Shelton, D. M., Walji, M., & Meric-Bernstam, F. (2005). Instruments to assess the quality of health information on the World Wide Web: what can our patients actually use? *International journal of medical informatics, 74*(1), 13-19.

Blackwell, D. L., Lucas, J. W., & Clarke, T. C. (2014). Summary health statistics for U.S. adults: national health interview survey, 2012. *Vital and health statistics. Series 10, Data from the National Health Survey*(260), 1-161.

Boothroyd, A. (2004). Hearing Aid Accessories for Adults: The Remote FM Microphone. *Ear and Hearing, 25*(1), 22-33.

Boothroyd, A. (2007). Adult Aural Rehabilitation: What Is It and Does It Work? *Trends in Amplification, 11*(2), 63-71.

Brault, M. W. (2012). *Americans with disabilities: 2010*: US Department of Commerce, Economics and Statistics Administration, US Census Bureau Washington, DC.

Breese, P., & Burman, W. (2005). Readability of Notice of Privacy Forms Used by Major Health Care Institutions. *JAMA, 293*(13), 1588-1594.

C.C., D., L., D., & J.H., R. (1996). *Teaching patients with low literacy skills* (2 ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Center, P. R. (2018). *Internet/Broadband Fact Sheet.* Retrieved from http://www.pewinternet.org/fact-sheet/internet-broadband/

Cerminara, C., Santarone, M. E., Casarelli, L., Curatolo, P., & El Malhany, N. (2014). Use of the DISCERN tool for evaluating web searches in childhood epilepsy. *EPILEPSY & BEHAVIOR, 41*, 119-121. doi: 10.1016/j.yebeh.2014.09.053

Chang, J., McAllister, C., & McCaslin, R. (2015). Correlates of, and barriers to, Internet use among older adults. *Journal of gerontological social work, 58*(1), 66-85.

Charles, C., Gafni, A., & Whelan, T. (1997). Shared decision-making in the medical encounter: What does it mean? (or it takes at least two to tango). *Social Science & Medicine, 44*(5), 681-692.

Charles, C., Gafni, A., & Whelan, T. (1999). Decision-making in the physician–patient encounter: revisiting the shared treatment decision-making model. *Social Science & Medicine, 49*(5), 651-661.

Charnock, D. (1998). *The DISCERN Handbook*. University of Oxford and The British Library: Radcliffe Medical Press Ltd.

Charnock, D., Shepperd, S., Needham, G., & Gann, R. (1999). DISCERN: An Instrument for Judging the Quality of Written Consumer Health Information on Treatment Choices. *Journal of Epidemiology and Community Health (1979-), 53*(2), 105-111.

Council, N. R. (2001). *Crossing the quailty chasm: a new health system for the 21st century*

Couper, M. P., Singer, E., Levin, C. A., Fowler Jr, F. J., Fagerlin, A., & Zikmund-Fisher, B. J. (2010). Use of the Internet and ratings of information sources for medical decisions: results from the DECISIONS survey. *Medical Decision Making, 30*(5_suppl), 106-114.

Danermark, B., Granberg, S., Kramer, S. E., Selb, M., Moller, C., Linköpings, u., . . . Institutet för, h. (2013). The Creation of a Comprehensive and a Brief Core Set for Hearing Loss

Using the International Classification of Functioning, Disability and Health. *American journal of audiology, 22*(2), 323-328.

Davis, A., Smith, P., Ferguson, M., Stephens, D., & Gianopoulos, I. (2007). Acceptability, benefit and costs of early screening for hearing disability: a study of potential screening tests and models. *HEALTH TECHNOLOGY ASSESSMENT-SOUTHAMPTON-, 11*(42).

Doak, C. C., Doak, L., & Root, J. H. (1996). Teaching patients with low literacy skills (2 ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Dobransky, K., & Hargittai, E. (2016). Unrealized potential: Exploring the digital disability divide. *Poetics, 58*, 18-28.

DuBay, W. H. (2004). The Principles of Readability. *Online Submission*.

Emanuel, E. J., & Emanuel, L. L. (1992). Four models of the physician-patient relationship. *Journal of the American Medical Association, 267*(16), 2221-2226.

English, K. M. (2008). Counseling Issues in Audiologic Rehabilitation. *Contemporary Issues in Communication Science and Disorders, 35*, 93.

Epstein, R. M., & Street, R. L. (2011). The values and value of patient-centered care: Annals Family Med.

Fackrell, K., Hoare, D. J., Smith, S., McCormack, A., & Hall, D. A. (2012). An evaluation of the content and quality of tinnitus information on websites preferred by General Practitioners. *BMC Medical Informatics and Decision Making, 12*(1), 70-70.

Farrell, P. K. (2011). *Improving health literacy for consumers: New ASHA audiology webpages.*

Fleiss, J. L. (1981). *Statistical methods for rates and proportions*

Fox, S. (2011a). *Health Topics: 80% of internet users look for health information online* Retrieved from http://www.pewinternet.org/files/oldmedia/Files/Reports/2011/PIP_Health_Topics.pdf

Fox, S. (2011b). *The social life of health information, 2011*: Pew Internet & American Life Project Washington, DC.

Freda, M. C. (2005). The readability of American Academy of Pediatrics patient education brochures. *Journal of Pediatric Health Care, 19*(3), 151-156.

Friemel, T. N. (2016). The digital divide has grown old: Determinants of a digital divide among seniors. *New Media & Society, 18*(2), 313-331.

Fry, E. (1968). A Readability Formula That Saves Time. *Journal of Reading, 11*(7), 513-578.

Gauld, R. (2011). Factors Associated With E-mail and Internet Use for Health Information and Communications Among Australians and New Zealanders. *Social Science Computer Review, 29*(1), 161-171.

Granberg, S., Pronk, M., Swanepoel, D. W., Kramer, S. E., Hagsten, H., Hjaldahl, J., . . . Institutet för, h. (2014). The ICF core sets for hearing loss project: Functioning and disability from the patient perspective. *International Journal of Audiology, 53*(11), 777-786.

Granberg, S., Swanepoel, D. W., Englund, U., Möller, C., Danermark, B., Region Örebro, l., . . . Institutionen för hälsovetenskap och, m. (2014). The ICF core sets for hearing loss project: International expert survey on functioning and disability of adults with hearing loss using the international classification of functioning, disability, and health (ICF). *International Journal of Audiology, 53*(8), 497-506.

Grenness, C., Hickson, L., Laplante-Lévesque, A., & Davidson, B. (2014). Patient-centred care: A review for rehabilitative audiologists. *International Journal of Audiology, 53*(sup1), S60-S67.

Grimes, G. A., Hough, M. G., Mazur, E., & Signorella, M. L. (2010). Older Adults' Knowledge of Internet Hazards. *Educational Gerontology, 36*(3), 173-192.

Gunning, R. (1952). The technique of clear writing.

Guyatt, G., Montori, V., Devereaux, P., Schünemann, H., & Bhandari, M. (2004). Patients at the center: in our practice, and in our use of language. *ACP journal club, 140*(1), A11-A11.

Hayden, J. D. (2008). Readability in the British Journal of Surgery. *British Journal of Surgery, 95*(1), 119-124.

Henshaw, H., Clark, D. P. A., Kang, S., & Ferguson, M. A. (2012). Computer skills and internet use in adults aged 50-74 years: Influence of hearing difficulties. *Journal of Medical Internet Research, 14*(4), e113-224.

Hickson, L., & Scarinci, N. (2007). *Older adults with acquired hearing impairment: applying the ICF in rehabilitation.* Paper presented at the Seminars in speech and language.

Hoffman, H. J., Dobie, R. A., Ko, C.-W., Themann, C. L., & Murphy, W. J. (2010). Americans Hear as Well or Better Today Compared With 40 Years Ago: Hearing Threshold Levels in the Unscreened Adult Population of the United States, 1959–1962 and 1999–2004. *Ear and Hearing, 31*(6), 725-734.

Hurley, J., Birch, S., & Eyles, J. (1992). *Information, efficiency and decentralization within health care systems*

Joosten, E. A., DeFuentes-Merillas, L., De Weert, G., Sensky, T., Van Der Staak, C., & de Jong, C. A. (2008). Systematic review of the effects of shared decision-making on patient

satisfaction, treatment adherence and health status. *Psychotherapy and psychosomatics, 77*(4), 219-226.

Kahn, A., & Pannbacker, M. (2000). Readability of educational materials for clients with cleft lip/palate and their families. *American Journal of Speech-Language Pathology, 9*(1), 3-9.

Kaicker, J., Debono, V. B., Dang, W., Buckley, N., & Thabane, L. (2010). Assessment of the quality and variability of health information on chronic pain websites using the DISCERN instrument. *BMC Medicine, 8*(1), 59-59.

Kincaid, J. P., & Naval Technical Training Command, M. T. N. R. B. (1975). *Derivation of New Readability Formulas (Automated Readability Index, Fog Count and Flesch Reading Ease Formula) for Navy Enlisted Personnel.*

Kindig, D. A., Panzer, A. M., & Nielsen-Bohlman, L. (2004). *Health literacy: a prescription to end confusion*: National Academies Press.

Klingbeil, C., Speece, M. W., & Schubiner, H. (1995). Readability of Pediatric Patient Education Materials: Current Perspectives on an Old Problem. *Clinical Pediatrics, 34*(2), 96-102.

Kuehn, B. M. (2009). States Explore Shared Decision Making. *JAMA, 301*(24), 2539-2541.

Kumar, V. S., Subramani, S., Veerapan, S., & Khan, S. A. (2014). Evaluation of online health information on clubfoot using the DISCERN tool. *JOURNAL OF PEDIATRIC ORTHOPAEDICS-PART B, 23*(2), 135-138.

Laplante-Lévesque, A., Brännström, K. J., Andersson, G., & Lunner, T. (2012). Quality and readability of English-language internet information for adults with hearing impairment and their significant others. *International journal of audiology, 51*(8), 618-626.

Laplante-Lévesque, A., Brännström, K. J., Andersson, G., Lunner, T., Handikappvetenskap, Linköpings, u., . . . Psykologi. (2012). Quality and readability of English-language

internet information for adults with hearing impairment and their significant others. *International Journal of Audiology, 51*(8), 618-626. doi: 10.3109/14992027.2012.684406

Laplante-Lévesque, A., Hickson, L., & Worrall, L. (2010). A qualitative study of shared decision making in rehabilitative audiology. *Journal of the Academy of Rehabilitative Audiology, 43*, 27-43.

Laplante-Levesque, A., Thoren, E. S., Handikappvetenskap, Linköpings, u., Institutionen för beteendevetenskap och, l., & Filosofiska, f. (2015). Readability of Internet Information on Hearing: Systematic Literature Review. *AMERICAN JOURNAL OF AUDIOLOGY, 24*(3), 284-288.

Leu, D. J., McVerry, J. G., O'Byrne, W. I., Kiili, C., Zawilinski, L., Everett-Cacopardo, H., . . . Forzani, E. (2011). The New Literacies of Online Reading Comprehension: Expanding the Literacy and Learning Curriculum. *Journal of Adolescent & Adult Literacy, 55*(1), 5-14.

Levinson, W., Kao, A., Kuby, A., & Thisted, R. A. (2005). Not all patients want to participate in decision making. *Journal of general internal medicine, 20*(6), 531-535.

Ley, P., Jain, V. K., & Skilbeck, C. E. (1976). A method for decreasing patients' medication errors. *Psychological Medicine, 6*(4), 599-601.

Lin, F. R., Niparko, J. K., & Ferrucci, L. (2011). Hearing loss prevalence in the United States. *Archives of Internal Medicine, 171*(20), 1851-1852.

MaineHealth. (2010). A guide to creating and evaluating patient materials: MaineHealth.

Manchaiah, V., Dockens, A. L., Flagge, A., Bellon-Harn, M., Azios, J. H., Kelly-Campbell, R. J., & Anderssonk, G. (2018). Quality and readability of English-language Internet information for tinnitus. *Journal of the American Academy of Audiology*.

Mc Laughlin, G. H. (1969). SMOG grading-a new readability formula. *Journal of reading, 12*(8), 639-646.

McCormack, L., Bann, C., Squiers, L., Berkman, N. D., Squire, C., Schillinger, D., . . . Hibbard, J. (2010). Measuring health literacy: a pilot study of a new skills-based instrument. *Journal of health communication, 15*(S2), 51-71.

McInnes, N., & Haglund, B. J. A. (2011). Readability of online health information: implications for health literacy. *Informatics for Health and Social Care, 36*(4), 173-189.

McKee, M. M., Stransky, M. L., & Reichard, A. (2017). Hearing loss and associated medical conditions among individuals 65 years and older. *Disability and Health Journal, 11*(1), 122-125.

OECD. (2001). *Understanding the Digital Divide* Retrieved from https://www.oecd.org/sti/1888451.pdf

Oleander. (2014). Readability Studio *[Computer software]*. Maharashtra, India: Oleander Software.

Parker, R. M., Williams, M. V., Weiss, B. D., Baker, D. W., Davis, T. C., Doak, C. C., . . . Nurss, J. (1999). Health literacy-report of the council on scientific affairs. *Jama-Journal of the American Medical Association, 281*(6), 552-557.

Peddie, K. A., & Kelly-Campbell, R. J. (2017). How people with hearing impairment in New Zealand use the Internet to obtain information about their hearing health. *Computers in Human Behavior, 73*, 141-151.

Preminger, J. E., Montano, J. J., & Tjørnhøj-Thomsen, T. (2015). Adult-children's perspectives on a parent's hearing impairment and its impact on their relationship and communication. *International Journal of Audiology, 54*(10), 720-726.

Preminger, J. E., Oxenbøll, M., Barnett, M. B., Jensen, L. D., Laplante-Lévesque, A., Handikappvetenskap, . . . Filosofiska, f. (2015). Perceptions of adults with hearing impairment regarding the promotion of trust in hearing healthcare service delivery. *International Journal of Audiology, 54*(1), 20-28.

Pryce, H., & Hall, A. (2014). The role of shared decision-making in audiologic rehabilitation. *SIG 7 Perspectives on Aural Rehabilitation and Its Instrumentation, 21*(1), 15-23.

Redish, J. (2000). Readability formulas have even more limitations than Klare discusses. *ACM Journal of Computer Documentation (JCD), 24*(3), 132-137.

Rees, C. E., Ford, J. E., & Sheard, C. E. (2002). Evaluating the reliability of DISCERN: a tool for assessing the quality of written patient information on treatment choices. *Patient Education and Counseling, 47*(3), 273-275.

Ritchie, L., Tornari, C., Patel, P., & Lakhani, R. (2016). Glue ear: how good is the information on the World Wide Web? *The Journal of laryngology and otology, 130*(2), 157.

Scarinci, N. A. (2009). *Third-party disability in spouses of older people with hearing impairment*.

Scarinci, N. A., Worrall, L., & Hickson, L. (2012). Factors Associated With Third-Party Disability in Spouses of Older People With Hearing Impairment. *Ear and Hearing, 33*(6), 698-708.

Sciacca, A., Meyer, C., Ekberg, K., Barr, C., & Hickson, L. (2017). Exploring Audiologists' Language and Hearing Aid Uptake in Initial Rehabilitation Appointments. *AMERICAN JOURNAL OF AUDIOLOGY, 26*(2), 110-118.

Seiden, C., Zorn, M., Ratzan, S., & Parker, R. (2000). National Library of Medicine current bibliographies in medicine: Health literacy (NLM Pub. No. CBM 2000-1). *Bethesda, MD: National Institutes of Health, US Department of Health and Human Services*.

Seymour, N., Lakhani, R., Hartley, B., Cochrane, L., & Jephson, C. (2015). Cochlear implantation: An assessment of quality and readability of web-based information aimed at patients. *Cochlear Implants International, 16*(6), 321-325.

Som, R., & Gunawardana, N. P. (2012). Internet chemotherapy information is of good quality: Assessment with the DISCERN tool. *British Journal of Cancer, 107*(2), 403-403.

Sparks, C. (2013). What is the "Digital Divide" and why is it Important? *Javnost - The Public, 20*(2), 27-46.

Stableford, S., & Mettger, W. (2007). Plain language: a strategic response to the health literacy challenge. *Journal of Public Health Policy, 28*(1), 71-93.

Stephens, D. (2001). World Health Organization's international classification of functioning, disability and health - ICF. *Journal of Audiological Medicine, 10*(3), vii-x.

Stewart, M., Brown, J. B., Donner, A., McWhinney, I. R., Oates, J., Weston, W. W., & Jordan, J. (2000). The impact of patient-centered care on outcomes. *Journal of Family Practice, 49*(9), 796-804.

Stiggelbout, A. M., Weijden, T. V. d., Wit, M. P. T. D., Frosch, D., Légaré, F., Montori, V. M., . . . Elwyn, G. (2012). Shared decision making: really putting patients at the centre of healthcare. *BMJ, 344*(7842), 28-31.

Swenor, B. K., Ramulu, P. Y., Willis, J. R., Friedman, D., & Lin, F. R. (2013). The Prevalence of Concurrent Hearing and Vision Impairment in the United States. *JAMA INTERNAL MEDICINE, 173*(4), 312-313.

Taylor, W. L. (1953). “Cloze procedure”: A new tool for measuring readability. *Journalism Bulletin, 30*(4), 415-433.

Thorén, E. S., Öberg, M., Wänström, G., Andersson, G., Lunner, T., Öron- näsa- och halskliniken, U. S., . . . Teknisk, a. (2013). Internet access and use in adults with hearing loss. *Journal of Medical Internet Research, 15*(5), e91.

Tye-Murray, N. (2009). *Foundations of aural rehabilitation: children, adults, and their family members* (3rd ed.). Clifton Park, NY: Delmar, Cengage Learning.

Veatch, R. M., & Veatch, R. M. (1972). Models for ethical medicine in a revolutionary age. What physician-patient roles foster the most ethical realtionship? *The Hastings Center report, 2*(3), 5-7.

Wagner, N., Hassanein, K., & Head, M. (2010). Computer use by older adults: A multi-disciplinary review. *Computers in Human Behavior, 26*(5), 870-882.

Wang, L.-W., Miller, M. J., Schmitt, M. R., & Wen, F. K. (2013). Assessing readability formula differences with written health information materials: Application, results, and recommendations. *Research in Social and Administrative Pharmacy, 9*(5), 503-516.

Warner, D. F., & Brown, T. H. (2011). Understanding how race/ethnicity and gender define age-trajectories of disability: An intersectionality approach. *Social Science & Medicine, 72*(8), 1236-1248.

Weiss, B. D. (2003). Health literacy. *American Medical Association*.

WHO. (2001). *International Classification of Functioning, Disability and Health: ICF*: World Health Organization.

WHO. (2005). *Global health promotion scaling up for 2015 - a brief review of major impacts and developments over the past 20 years and challenges for 2015.*

WHO. (2018). *Deafness and hearing Loss.* Retrieved from http://www.who.int/en/news-room/fact-sheets/detail/deafness-and-hearing-loss

Wong, K., & Levi, J. R. (2017). Readability of pediatric otolaryngology information by children's hospitals and academic institutions. *The Laryngoscope, 127*(4), E138-E144.

Zarcadoolas, C., Pleasant, A., & Greer, D. S. (2009). *Advancing health literacy: A framework for understanding and action* (Vol. 45): John Wiley & Sons.

Zhan, W., Cruickshanks, K. J., Klein, B. E. K., Klein, R., Huang, G.-H., Pankow, J. S., . . . Tweed, T. S. (2010). Generational Differences in the Prevalence of Hearing Impairment in Older Adults. *American Journal of Epidemiology, 171*(2), 260-266.

Zickuhr, K., & Smith, A. (2012). *Digital differences* Retrieved from http://www.pewinternet.org/2012/04/13/digital-differences/

Zraick, R. I., Atcherson, S. R., & Ham, B. K. (2012). Readability of Patient-Reported Outcome Questionnaires for Use with Persons with Swallowing Disorders. *Dysphagia, 27*(3), 346-352.